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THE EMERGENCE OF OPERATIONAL ART FOR SPACE: IS IT TIME FOR ANOTHER MITCHELL OR MAHAN?

by

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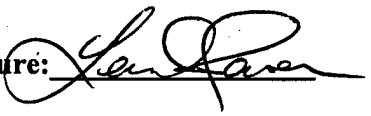
A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirement of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: 

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Abstract of

THE EMERGENCE OF OPERATIONAL ART FOR SPACE:
IS IT TIME FOR ANOTHER MITCHELL OR MAHAN?

Operational art for space was thrust upon the U.S. military for the first time with the execution of Desert Storm. The conduct of space operations as directed by USCINCSPACE during the Gulf War, and subsequent changes in military organizations, training and education point to the emergence and beginning evolutions of space operational art much as it happened for sea and air power. By categorizing the operational utility of military power for a specific medium into four historical stages, the emergence and evolution of sea and air power are traced and then applied to space. Given the identifiable characteristics of each stage with respect to technology, societal views and military thinking, it is clear that the development of space operational art is at the same stage as sea power was before WWI and air power during the early interwar period. Given this understanding, the lack of space theory and doctrine before Desert Storm is expected and consistent with the corresponding level of technology and societal hesitation towards military space. However, Desert Storm ushered in a new stage of space power development, necessitating a reinvigoration of debate and the development of a unifying doctrine and a more comprehensive operational art for space. The vision of another Mitchell or Mahan for space will provide the foundation for the needed mobilization of both public support and the national leadership. The United States is poised for a national debate on the militarization of space and the subsequent decisions may well impact whether space is ready for the next war or not.

Introduction

Desert Storm, commonly referred to as the first space war, catapulted the strategically focused space power of the United States onto the operational arena. Many have written since then on the lack of theory, doctrine and operational art for space. Just as operational art emerged for the mediums of land, sea and air power, and then evolved, so too will it for space. The question now, seven years after Desert Storm, is has space operational art emerged and if so, where is it in the emergence process. The answer to these questions looms ever more important as the United States begins another critical juncture in the development of space power. Looming on the near horizon is what some are calling a need for a national debate on the militarization of space to ensure space dominance.[1] Juxtaposing the historical emergence of sea and air power with the current state of space power development and operational art will provide a historical foundation. For a clear understanding of where space operational art is and where it needs to go will better prepare the military for both the debate on militarization of space and, more importantly, the application of space power to the next war.

This paper will concentrate on answering three questions. The first is has operational art emerged for space power. Milan Vego suggests the emergence of operational art will result in changes in the conduct of war, military organizations, military education, and military training.[2] Through an examination of these four areas with respect to space power, the answer to the first question will be deduced. The next question is if space operational art has emerged, where is it in the emergence process. An examination of the emergence process for sea and air power will identify distinct stages and common factors which through juxtapositioning will pinpoint the current state of space operational art emergence. Finally, given the above historical analysis and conclusions, the answer to what future impediments to the development of space operational art lie ahead and actions required to overcome them will be suggested, to include answering the question imbedded into the title of this paper.

Has Space Operational Art Emerged?

The evaluation of whether space operational art has emerged begins with a need to understand what operational art is. However, given the scope and complexity of the subject, a common definition is difficult to find agreement on.[3] In its broadest form, operational art is one of the three components of military art, bridging the gap, albeit with some overlap, between the other two; strategy and tactics.[4] Given this general understanding, a brief examination of the changes with respect to space on the conduct of war and military organization, education and training will be used to evaluate whether or not space operational art has emerged.

Conduct of War

Both theory and doctrine reflect how the military views the conduct of war. Doctrine is generally based on the study and analysis of experience, i.e. what has usually worked best in the past. However, when those experiences are lacking, it may also rely on theory. Both are important as Milan Vego advises that theory is critical to operational art providing a sound basis for improvisation.[5] From a space power perspective, it is even more so given the lack of historical experiences.

Since Desert Storm and the collapse of the Soviet Union, there has been a reinvigoration of developing doctrine to include space doctrine at both the joint and service levels. Joint Doctrine 3-14, Space Operations, is in development and work on an Air Force operational level space doctrine, AFDD 2-2, is ongoing. In 1995, the Army published FM 100-18, Space Support to Military Operations. In addition to unique space doctrine, the impact of space is reflected across all aspects of military operations and incorporated into both joint and service basic doctrine.

Before Desert Storm, there was little written about military space theory with the exception of a narrowly focused segment supporting the Strategic Defense Initiative. After Desert Storm, there was a renewed interest but no single set of definitive work. In 1996, Colin Gray stated, "space power suffers from an unusual malady -- an acute shortage of

space focused strategic theory and the lack of a binding concept."[6] He then offers a foundation for space power theory based on Clausewitzian ideas. Many others have written about the need for a unified space theory and have offered their version of what it should be.[7] In 1997, for the first time, USSPACECOM took steps towards developing a unified written theory.[8]

While the availability of published space doctrine and theory is limited, it is important to acknowledge that the need has been recognized and efforts are underway to remedy the situation. While not a substitute for doctrine and theory, policy and vision documents help shape how the military will utilize space in conducting the next war. All military power, to include space power, exists to support national policy and as such a new National Space Policy issued in 1996 influences the U.S. conduct of war with implications to the operational commander.[9] In addition, policies such as the recent Army Space Policy published in July, 1994, exemplify the impact that space has made by stating, "Space applications will be embedded in Army doctrine, training scenarios, wargames, exercises, and plans."[10]

Finally the conduct of war is driven by operations war plans. It is here, in the space annex (annex N), where space has been integrated at the operational level into the various phases of theater combat operations. Today, current operational plans at both the joint and component levels include space operations annexes. In addition, from a space operational art perspective, CINCSPACE and its components develop individual supporting plans where the operations annex is focused on space operations, detailing how CINCSPACE will plan, employ, and sustain space forces in support of major operations; the essence of space operational art.

Military Organization

In today's military structure, the primary domain for operational art is at the Unified CINC level. Given this, the creation of US Space Command (USSPACECOM) as a functional CINC in 1985 laid the foundation for an organization to conduct operational art. Current efforts are also ongoing to treat space as an Area of Responsibility providing

CINCSPACE the same authorities as other regional CINCs.[11] Together with its three service components, Army Space Command (ARSPACE), Naval Space Command (NAVSPACE) and 14th Air Force (AFSPACE), the organizational structure is in place to plan, conduct and sustain major space operations and campaigns. With these organizations in their infancy, space force enhancement operations were conducted in support of Desert Storm. Despite their successes, several authors have identified shortfalls in this support and additional evolutionary organizational changes have been instituted to address these concerns.[12] Both unified and service space support teams were created to facilitate on-site space support to regional CINCs and the corresponding components. The Air Force established the Space Warfare Center (SWC) in 1993 and the Space Battle Lab in 1997. USSPACECOM and its components have all established 24-hour space operations centers and there are ongoing discussions to effectively command and control space activities via a space tasking order, similar to how the air component controls air assets with the air tasking order.

While USSPACECOM has COCOM of military space assets, space power still lacks unity of command due to the control of National Systems by the National Reconnaissance Organization and its mission partners, the national Security Agency (NSA), the National Imagery and Mapping Agency (NIMA), the Central MASINT Office, The Defense Intelligence Agency (DIA) and the central Intelligence Agency (CIA). while still lacking unity of command, efforts have been taken to facilitate unity of effort for the prosecution of space operational art.[13]

In addition to operational art orchestrated by Unified CINCs, major operations are also conducted by a joint task force and its service/functional components. Yet, who the commander is for space forces under the joint task force commander has not been answered to everyone's satisfaction. Several authors have suggested the need for a Joint Force Space Component Commander (JFSCC) but the debate continues with no apparent resolution.[14]

The examination of space power organizations is not complete without considering the inter-relationships between military and commercial space communities. No where else

is the military's reliance as great on the commercial sector as with space. Given shrinking budgets and the high costs of space assets, DoD's Space Architect is leading the evaluation effort to achieve the right mix of commercial assets into the military forces.[15] The operational commander now faces the dilemma controlling commercial space assets that he is reliant upon and also denying those assets to the adversary. It is clear that while the organizational foundations are in place to support space operational art, it has yet to be optimized.[16]

Military Education

One of the significant observations made after Desert Storm was the lack of experience U.S. forces had with space support, at both the tactical and operational levels.[17] In response, several space educational programs have been initiated. At all levels of Professional Military Education, space has been integrated to include a space block within the Joint Flag Officer Warfighting Course. The Air Force Space Warfare Center created the Space Weapons Instructor Course which may one day become to space what the Air Corp Tactical School was for air power during the interwar period. In addition to the formal educational programs, space education is a key component of military exercise and wargames.

Military Training

Training can be divided into two general areas, exercises and wargaming. Exercises are driven by mission task essentials, i.e. train like you're going to fight. Wargames on the other hand, are forward looking, often based on future threat scenarios. Both are valuable tools that prompt operational leaders to think about space and the conduct of war.

Space is now routinely part of the planning and execution of nearly all major joint exercises and numerous service exercises. The USSPACECOM staff support planning and exercise control while the Joint Space Support Teams and their service component counterparts participate in the exercise execution. In addition, selected exercises are also supported by the USSPACECOM crisis action team to include participation by the CINC and

his component commanders. These exercises stress the operational art of CINCSPACE in addition to the Theater Joint Force Commander. Scenarios have included CINCSPACE orchestrating a space campaign through the support of multiple theater commanders.

With the publishing of Joint Vision 2010, the focus on future military operations and space implications has intensified. Recent wargames have pointed to potential space vulnerabilities and have illuminated the "space dominance" debate.[18] While the wargames are conducted using futuristic scenarios, the observations made have implications for policy decisions being made today. The debate over militarizing space, or controlling space via treaties, will have enormous impacts on future operational space commanders trying to bridge the strategic and tactical realms.

Space has made significant changes in how the U.S. military organizes, trains, and educates in preparing for the next war. Space operations impact the conduct of war across the entire spectrum of conflict requiring decisions at the strategic, operational and tactical levels. It is clear given the Gulf war and changes made thereafter, that operational art for space has emerged supported by a foundation in organization, training and education. While many have noted the lack of written doctrine and a unifying theory, this does not in itself, denote the lack of operational art. Space operational art was thrust upon CINCSPACE in Desert Storm and will continue to evolve based on the thoughts of space power advocates, many who are listed in this paper's bibliography. To further facilitate this evolution, in 1996, USCINCSPACE created an annual "Operational Art of Space Warfare" essay contest.[19] Much as operational art for the sea and air emerged within the bowels of war and then evolved over time, so has space power.

What Stage is Space Power Development At?

An analysis of factors impacting the emergence of sea and air power will illuminate the sometimes nebulous path space operational art development seems to be on. Although there are many factors to choose from, the following three dominant factors were selected;

technology, society to include both public support and national leadership, and military thinking.[20]

The emergence and subsequent evolution of operational art is not constant but progresses through distinct stages. This paper will utilize Colin Gray's four stages of strategic utility for military power, but evaluated from an operational rather than strategic perspective.[21] The three factors of technology, society and military thinking will be examined for both sea and air power against Gray's four stages:

(1) Experimental/marginal adjunct to terrestrial forces

(2) Useful and important adjunct

(3) Indispensable adjunct

(4) Independent war winner

Stage one is characterized by new and immature technology dominated by the scientific and R&D communities. Military thinking consists of few visionaries and tacticians supported by little or no doctrine. The national society is generally complacent and unmotivated, either reluctant or resistant to support major change. Operational art is generally non-existent prior to the first wartime tactical applications and then is more ad hoc than preplanned.

Stage two is characterized by experimentally proven technology which has demonstrated tactical military utility and the need for operational art. There is a limited military industrial base accompanied by a growing commercial sector. Military thinking is a mix of vision and operational experience accompanied by growing debate and doctrinal development, followed by an emerging dominant view. Society begins to recognize the impact of exploiting this new medium from both a military and commercial perspective. Military proponents during this period try to rally public and national leadership support, often tying the need for military capabilities with national wealth and commercial growth.

Stage three is characterized by a mature technology supported by a robust industrial base and a burgeoning commercial sector. Military thinking is primarily operational

supported by a mature doctrine. Society is cautious, confronted by escalating costs associated with maturing systems and competition of missions between different mediums. Stage three also corresponds to an ability for that medium, e.g. sea, air or space, through the misapplication of operational art, to lose the war, yet is still unable to win the war independently.

Stage four is difficult to characterize since it is doubtful that any medium will be so dominant as to become an independent war winner. It would require such a leap in technology that it would constitute a true revolution in military warfare.

Stage One Synopsis: Experimental/Marginal Adjunct to Terrestrial Forces.

Stage one for sea power begins in 1880 with naval forces transitioning from sail to steam. New technologies of efficient steam engines, lighter steel armor, wireless telegraph and advances in gunnery enabled the potential for modern blue-water combat force operations.[22] Alfred Mahan's dominated naval theory with his concepts of sea control and maritime national wealth. The beginning of the period was marked by a nation still committed to naval coastal defense and reluctant to embrace expansionism.[23] By the end however, society was leaning toward a new imperialism marked by the war with Spain in 1898 and the validation of the naval transition from passive defense to offensive sea control.[24]

Stage one for air power logically begins with first flight in 1903 and ends with the advent of WWI and the first tactical applications of air power in war. The first U.S. Aero Squadron was created in 1914 but the technology prior to WWI was primitive, with limited power and range, restricting air power to primarily a reconnaissance role. Military air power theory was in its infancy, led by European theorist such as Trenchard and Douhet. WWI was the turning point for military aviation, propelling rapid advances in technology and tactics. Yet, despite the tactical applications of air power in WWI, many were still not convinced of its operational role as a military instrument of power.[25]

Stage Two Synopsis: Useful and Important Adjunct.

Stage two for sea power begins with the tactical successes in both Cuba and the Philippines during the war with Spain and culminates with blue-water operations in WWI. Technology during this period was marked by the integration of multiple seafaring platforms into a single fleet including torpedo boat destroyers, battleships and dreadnoughts and also introduced submarine warfare.[26] Theory and doctrine development flourished based on the recent Spanish-American War of 1898 and the Russo-Japanese War of 1904-5. Doctrinal debates were led by Alfred Mahan and Julian Corbett but the appeal of Mahan's theory to the American appetite for expansionism and President Theodore Roosevelt's desire to become a major world naval power dominated, resulting in the "Great White Fleet" of 1907. While the Mahanian decisive fleet engagement never materialized in WWI, there was no doubt as to the indispensable need for sea power and its operational art.

Stage two for air power begins with WWI and the demonstration of tactical air support and ends with WWII and the prosecution of strategic bombing operations. Technology rapidly advanced in the areas of range, speed and bomb load capacity. U.S. air power theory and doctrine also advanced led by Billy Mitchell and his followers at the Air Corps Tactical School. Additionally during this period, the role of air power's importance was demonstrated by Billy Mitchell's sinking of the unsinkable German Battleship *Ostfriesland.*[27] The American public's endorsement of military air power was facilitated by books written by Mitchell, Arnold and De Seversky and accompanied by a rapid expansion in commercial aviation. At the conclusion of WWII, air power was equated with American prestige and despite the debate on the significance of strategic bombing, air power had proven its indispensable nature to the American way of war.

Stage Three Synopsis: Indispensable Adjunct

Stage three for sea power begins with WWI and the vital need to maintain control of the sea lines of communications. The advent of air and subsurface technologies challenged naval doctrine and strategy based on a surface naval power second to none. Given the

expansion of multiple roles and missions, the projected costs of fully developing sea power loomed ominous, with the potential for an escalating naval arms race. American society was cautious, leading to the Naval Arms Limitation Treaty of 1922.[28] Subsequently, the Navy developed military capabilities to exploit all the varying aspects of the sea medium to include surface, air and subsurface, always driving technology and doctrine towards stage four and the ability to become an independent war winner. However, after nearly eight decades of pursuing stage four, the current strategy of Forward from the Sea and littoral warfare has firmly entrenched naval power in stage three.

Stage three for air power begins in the aftermath of WWII and the importance of air superiority and the massive strategic bombing air operations. Just as with sea power, the drive for air power to be an independent war winner drove the technology and doctrine to support strategic bombing with intercontinental bombers and nuclear weapons. Desert Storm, supported by a mature air power technology, may have demonstrated the potential for air power to become an independent warwinner. Since it is inconclusive, the debate will continue.

Given the above analysis, the following observations are made about transitioning from one stage to another. The transition from stage one to stage two is marked by the first wartime tactical application of military power within that medium, demonstrating potential value to an operational commander in achieving operational and strategic objectives. This demonstrated potential invigorates theory and doctrine development, together with technologic improvements. From this arises a buildup in forces and the requisite for establishing supporting frameworks in organization, training and education, for the efficient execution of operational art.

The transition from stage two to stage three is supported by a maturing technology, a burgeoning industrial base, and a corresponding growth in the commercial segment. Theory and doctrinal debate are rampant in stage two but by the transition, a single vision, usually the one best having potential to propel that mediums power through stage three into stage

four as an independent warwinner dominates e.g. Mahan's sea control and Mitchell's strategic bombing. Additionally, stage two has successfully rallied both public and national leadership support for military expansion enabling the force structure required to transition into stage three.

Given these observations, stage one for space power started with the first satellite launch in 1957 and ends with the tactical application of space-based force enhancements in support of military operations in Desert Storm. Although this initial stage is longer than those for sea or air power, this is driven by a number of factors. Leaps in both technological development and monetary resources created a barrier to entry considerably greater than the others. Unlike sea and air power, the transition from platform to weapon system requires considerable technological improvements as demonstrated by the billions spent during the failed Strategic Defense Initiative nearly thirty years after the first space platform was orbited. In addition to technology, the necessary societal support, both public and national leadership, were not in place, based partly on the minimal space threat and treaty limitations. Finally, just as the failure of a blue-water navy in 1898 and tactical air power in WWI would not have lost the war, the failure of space force enhancement in Desert Storm would not have lost that war. These factors, then, are all consistent with space development being in stage one and support Desert Storm marking the transition for space into stage two rather than stage three as Colin Gray suggests.[29]

Stage two for space power therefore, begins with the demonstration of space force enhancement in Desert Storm and will only transition to stage three as an indispensable adjunct to terrestrial warfare in one of two scenarios. Scenario one is the acceptance and support from the American society for the militarization of space to include force application and the subsequent technological advancements required. This will then allow space power to directly impact terrestrial warfare in the traditions of force application. This scenario will require considerable changes during stage two in the practice of space operational art. The second scenario hinges on the much discussed potential transformation of warfare from

traditional force application to information warfare. If this transformation occurs, then space force enhancement will ride the wave of this revolution into stage three as an indispensable medium for military application. This scenario suggests the need to provide space dominance to include some of level of space control to protect our own space forces and deny those of the enemy. In both scenarios, the key juncture for transitioning from stage two to stage three is the decision to support weapons in space either for force application or space control. Both will require significant changes in military organization, training and education to effectively execute space operational art for the next war.

What Lies Ahead For Space Operational Art?

Stage two for space demands requirements that if not addressed, will have serious consequences compared to the those of stage one. The extended period of stage one for space proved frustrating to many budding space visionaries whose call for theory and doctrine went unanswered, dating back to the Military Space Doctrine Symposium held in 1981.[30] From an operational perspective, the lack of doctrine, operational art, technology, public support, and national leadership for military space in stage one was normal, given the marginal role it played in operational warfare.[31] Desert Storm however, just as the war with Spain did for sea power and WWI did for air power, transitioned space into stage two, enabling serious debate and subsequent development of substantiated doctrine and operational art to begin. Accompanying this is the public awareness level and commercial industry development consistent with stage two. Just as Mahan and Mitchell rallied public and/or national leadership support, tying the prestige and power of the United States to sea and air power development, so to must space power. Space power has become an important adjunct to terrestrial warfare and will quickly transition to stage three as an indispensable adjunct. General Howell Estes III, USCINCSPACE, recently stated, "Our actions regarding space over these next few years will set the course for the next quarter century..."[32] The changes made since the Gulf War have ensured space operational art will be effectively executed for

another Desert Storm, but the next war may be far different and the actions taken now with respect to space operational art development may well determine its outcome.

The U.S. is now facing a national debate on the militarization of space and the time is upon us for a Mahan or Mitchell for space to engage the issue. The door has been opened by a distinguished group of 43 retired general officers publicly releasing an Open Letter to the President urging "heed the recommendations of the National Defense Panel with respect to assuring an American capability to deny our enemies the use of space".[33] But just as Mahan had the Naval War College and Mitchell had the Air Corps Tactical School, the next space advocate needs fertile ground for support and to carry on the message. History predicts that a Mahan or Mitchell for space will emerge. The time is right and the military needs to declare where the fertile ground will be, for it is still unclear where the center for military space thinking lies.

Conclusion

Operational art was thrust onto the battlefield with the first tactical application of blue-water sea power in the war with Spain in 1898 and fledgling air power in WWI. For space power, Desert Storm and its aftermath marked the emergence of space operational art. With little formalized preparation, USCINCSPACE for the first time aided the accomplishment of operational and strategic objectives through the employment and sustainment of space power. The conduct of Desert Storm and subsequent changes in military organizations, training and education support the assertion that space operational art has emerged and is evolving.

Space power, like sea and air power before it, is transitioning through incremental stages of operational utility to terrestrial warfare. It is clear, given the current technology, societal views and military thinking, that space power is at the same stage as sea power was prior to WWI and air power was early in the interwar period. And just as these periods provided the opportunity for Mahan and Mitchell to influence military thinking and rally national support for their respective mediums and operational art development, so too is now

the time for another Mahan or Mitchell for space to emerge. While history dictates the actions required during this stage to adequately prepare for the next, it does not predict the time allowed before the transition to the next stage via the test of war. The answer to Steven Bruger's question, "Not ready for the first space war, what about the second?" may well depend upon the evolution of space operational art in the coming years.[34]

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[1] Frank Gaffney, "Clinton Policy Would Disarm U.S. Space Capabilities", Defense News, November 17-23, 1997. Also the Center for Security Policy Press Release No 98-P8, "Top Defense Practitioners Establish that President, Pentagon Must Ensure U.S. Can Exercise Space Dominance", 16 Jan 98.

[2] Milan Vego, "Operational Art" Lecture, US Naval War College, Newport RI: 20 November 1997

[3] Milan Vego, On Operational Art (Draft), Naval War College, Newport RI, September, 1997, 4-5.

[4] Ibid., 7-8.

[5] Ibid., 10.

[6] Colin S. Gray, "The Influence of Space Power upon History", Comparative Strategy, Volume 15 , Number 4, 1996, 304.

[7] See Robert Newberry's "Space Doctrine for the 21st Century", 1997, Michael Mantz's The New Sword, A Theory of Space Combat Power, 1995, and David Lupton's On Space Warfare: A Space Power Doctrine, 1988.

[8] Maj Tim Coffin, USSPACECOM CINC's Action Group, interview by author, 2 Feb 1997.

[9] William C. Wellman, "United States National Space Policy and Its Implications on the Operational Commander" (Unpublished Research Paper, Naval War College, Newport RI: 1997).

[10] Army Space Policy, July 1994.

[11] Unified Command Plan Joint Faculty Education Conference Briefing, CAPT Jim Stavridis, July 1997.

[12] Theresa M. Philips, "Space Support at the Operational Level: How Have we Learned the Lessons of Desert Storm?" (Unpublished Research Paper, Naval War College, Newport RI: 1996), Frank Gallegos, "After the Gulf War: Balancing Spacepower's Development", (Unpublished Research Paper, School of Advanced Airpower Studies, Maxwell AFB AL, 1995).

[13] Keith R. Hall, National Reconnaissance Office presentation to the Senate Armed Services Committee Strategic Forces Subcommittee, 12 March 1997.

[14] William C. Wellman, 10-11; Ricky B. Kelly, "Centralized Control of Space: The Use of Space Forces by a Joint Force Commander", (Unpublished Research Paper, Air Command and Staff College, Maxwell AFB, AL: 1994), 51; Charles A. Horner, "Space Systems Pivotal to Modern Warfare", Defense 94, 20-29.

[15] Bill Gregory, "Leveraging Space Investments", Armed Forces Journal International, August 1997, 34-39.

[16] Warren Ferster, "U.S. Agencies Still Vying to Control Imagery Firms", Space News, 5 Jan 98.

[17] Frank Gallegos, 1-29.

[18] Warren Ferster, "Space Game Reveals Vulnerability" Space News, 16 June 1997.

[19] UI35-15, United States Space Command Operational Art of Space Warfare Essay Contest", 26 January 1996.

[20] Milan Vego, Lecture.

[21] Colin S. Gray, 294-295.

[22] Karl Lautenschlager, Technology and the Evolution of Naval Warfare, (Washington: National Academy Press, 1984), 18-25.

[23] Dale N. Hagen, "Mahan's Influence on United States Naval Strategy through 1918", Unpublished Research Paper, Army War College, Carlisle Barracks, PA: 1973, 16.

[24] George Baer, One Hundred Years of Sea Power, (Stanford: Stanford University Press, 1994), 30-31.

[25] Alfred F. Hurley and Robert C. Ehrhart, ed. Air Power and Warfare, (Washington: GPO, 1978), 65.

[26] Karl Lautenschlager, 25-29

[27] Peter L. Hays suggests this is the first of three critical steps in the development of airpower, the other two being the development of unescorted daylight precision strategic bombardment and the evolving military belief in the need for an independent Air Force. Struggling Towards Doctrine: U.S. Military Space Plans, Programs, and Perspectives During the Cold War, Unpublished Doctoral Dissertation, Fletcher School of Law, and Diplomacy, 1994, 28-29.

[28] George Baer, 99.

[29] Colin Gray, 295.

[30] Brigadier General Vogt stated "I believe that many of the questions asked about space policy and doctrine, and most assertions toward that light, are of the cart before the horse variety", see A Book of Readings for the United States Air Force Academy Military Space Doctrine Symposium, Dept of Astronautics and Computer Science, United States Air Force Academy, 1-3 April, 1981, p867. Of over 1000 pages on the need for space doctrine and organizational change, BG Vogt's comments are the rare notes of caution.

[31] However, from a strategic perspective, space played an important role during the cold war. See Peter L. Hays, 1-469.

[32] Howell M. Estes,III, "The Air Force at a Crossroad", Speech. Air Force Association National Symposium, Los Angeles, CA: 14 November 1997.

[33] The Center for Security Policy, Press Release, No. 98-P7, Attachment, 15 January 1998.

[34] Steven Bruger, "Not Ready for the First Space War, What about the Second", Naval War College Review, Winter 1995, 73.

BIBLIOGRAPHY

Baer, George W., One Hundred Years of Sea Power, Stanford, Stanford University press, 1994.

Berkowitz, Marc J., "Future U.S. Security Hinges on Dominant Role in Space", Signal, May 1992.

Billman, Gregory, "The Inherent Limitations of Spacepower: Fact or Fiction?", Unpublished Research Paper, School of Advanced Airpower Studies, Maxwell AFB, AL: June1996.

Bruger, Steven J., "Not Ready for the First Space War, What about the Second", Naval War College Review, Winter 1995.

Center for Security Policy, "Press Release No. 98-P7(Attachment)", 15 January 1998.

Estes, Howell M. III, "The Air Force at a Crossroad", Speech. Air Force Association National Symposium, Los Angeles, CA: 14 November 1997.

Ferster, Warren, "Commercial Satellite Use Poses Military Quandary / U.S. Army War Game Shows Asset Becomes Enemy Tool", Space News, 20 October 1997.

_____, "U.S. Agencies Still Vying to Control Imagery Firms", Space News, 5 January 1998.

Gaffney, Frank , "Clinton Policy Would Disarm U.S. Space Capabilities", Defense News, November 17-23, 1997.

Gallegos, Frank "After the Gulf War: Balancing Spacepower's Development", Unpublished Research Paper, School of Advanced Airpower Studies, Maxwell AFB, AL: June1995.

Gray, Colin S. , "The Influence of Space Power upon History", Comparative Strategy, Volume 15 , Number 4, 1996.

Gregory, Bill, "Leveraging Space Investments", Armed Forces Journal International, August 1997.

Hagen, Dale N., "Mahan's Influence on United States Naval Strategy through 1918", Unpublished Research Paper, Army War College, Carlisle Barracks, PA: January 1973.

U.S. Congress. Senate. Committee on Armed Services. DOD Space Programs and Issues. Hearings before Subcommittee on Strategic Forces. 12 March 1997.

Hattendorf, John B. and Robert S. Jordan,ed. Maritime Strategy and the Balance of Power, New York, St. Martin's Press, 1989.

Hays, Peter L., "Struggling Towards Doctrine: U.S. Military Space Plans, Programs, and Perspectives During the Cold War", Unpublished Research Paper, Fletcher School of Law and Diplomacy, Medford, MA: May 1994.

Hurley, Alfred F. and Robert C. Ehrhart, ed. Air Power and Warfare, Washington, GPO, 1978.

Lautenschlager, Karl , Technology and the Evolution of Naval Warfare, Washington, National Academy Press, 1984.

Horner, Charles A., "Space Systems Pivotal to Modern Warfare", Defense 94, Issue 4.

Kelly, Rick B., "Centralized Control of Space: The Use of Space Forces by a Joint Force Commande , Unpublished Research Paper, School of Advanced Airpower Studies, Maxwell AF B, AL: 22 September 1994.

Lupton, David E., On Space Warfare: A Space Power Doctrine, Air University Press, Maxwell AFB, AL, 1988.

Mantz, Michael R., The New Sword, A Theory of Space Combat Power, Air University Press, Maxwell AFB, AL, 1995.

Meadows, Sandra I., "Air Force Plan to Become Space Power Called Premature by Pentagon Official", National Defense, October 1997.

National Science and Technology Council, "National Space Policy", The White House, Washington DC, 19 September 1996.

Newberry, Robert, "Space Doctrine for the 21st Century, Unpublished Research Paper, Air Command and Staff College, Maxwell AFB, AL: March 1997.

Newell, Clayton, "What is Operational Art?", Military Review, September 1990.

O'Leary, Tom, "The Foundation of Operational Art in the Naval Service", Unpublished Research Paper, Naval War College, Newport, RI: 17 June 1994.

Philips, Theresa M, "Space Support at the Operational Level: How Have we Learned the Lessons of Desert Storm?" Unpublished Research Paper, Naval War College, Newport, RI: 12 February 1996

Schneider, James J., "Theoretical Implications of Operational Art", Military Review, September 1990.

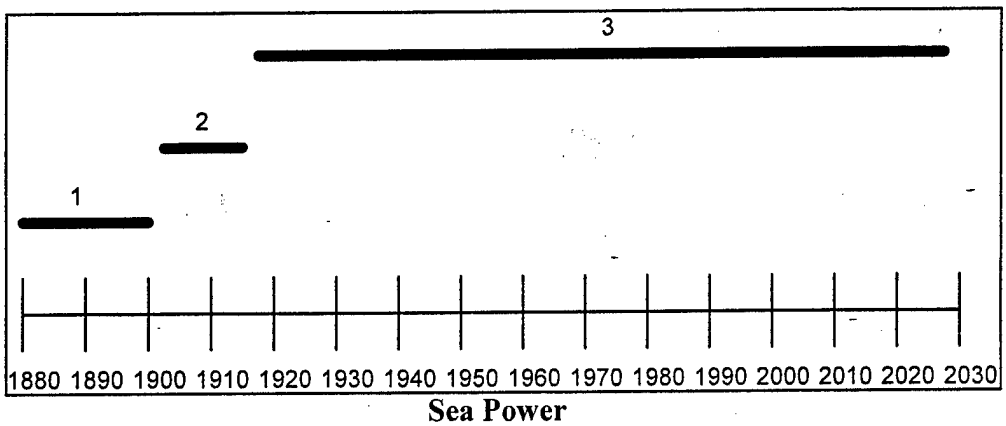
Seffers, George I., "Space Game Reveals Vulnerability / U.S. Army Says Treaties May Protect Satellite Fleet" Space News, 16 June 1997.

Swan, Peter A., compiler, Military Space Doctrine-The Great Frontier: A Book of Readings fro the United States Air Force Academy Military Space Doctrine Symposium, 1-3 April 1981, Vol. I-IV, Colorado Springs, CO, USAF Academy, 1981.

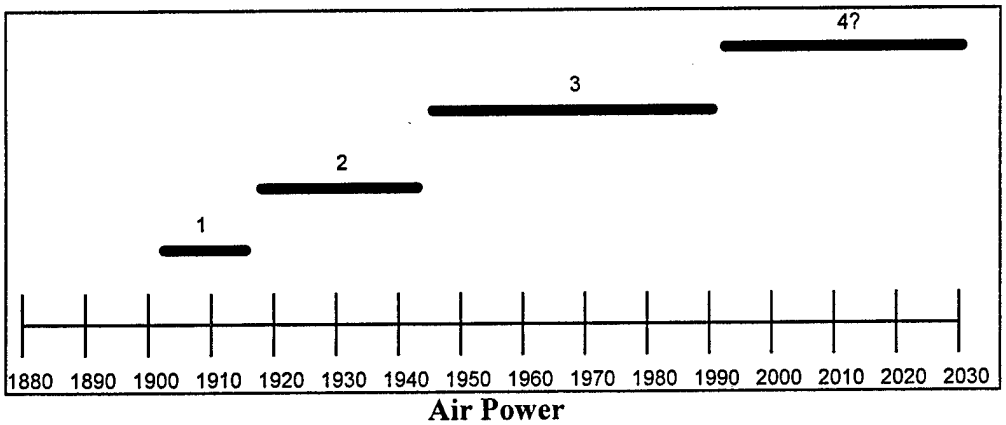
UI35-15, United States Space Command Operational Art of Space Warfare Essay Contest, 26 January 1996.

Wellman, William C., "United States National Space Policy and Its Implications on the Operational Commander" Unpublished Research Paper, Naval War College, Newport RI: 13 June 1997.

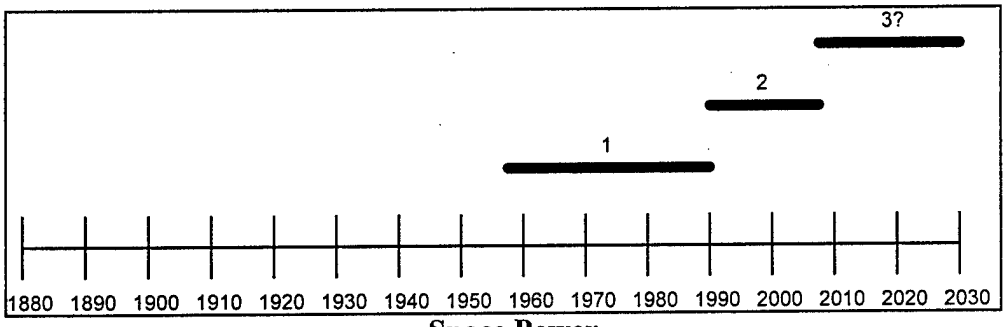
APPENDIX A: Operational Utility of Military Power[1]



Sea Power



Air Power



Space Power

Stage 1: Experimental/Marginal Adjunct to Terrestrial Forces
Stage 2: Useful and Important Adjunct
Stage 3: Indispensable Adjunct
Stage 4: Independent War Winner

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[1] Based on Colin Gray's strategic utility.stages, "The Influence of Space Power upon History", Comparative Strategy, Volume 15 , Number 4, 1996, p 295.